CSIS-Sandia GLOBAL WATER FUTURES Project

An Overview on Water Issues in China

Issues in Supply:

China's most serious water supply problems do not stem from inadequate resources, rather unequal distribution. Serious levels of water pollution have aggravated the situation.

1. Distribution:
   - North vs. South: Water resources are unevenly distributed between the northern and southern regions. In the South (south of and including the Yangtze), the population accounts for 46.5% of the national total, arable land 35.2%, GDP 54.8%, yet total water resources amount to 80.5% of the national total. In the North, 19.5% of the nation's water resources go to 53.5% of population, 64.8% of the arable land, and 45.2% of GDP .
   - Flood Season vs. Drought Season: Rainfall in China is highly seasonal. In most areas, 70% of precipitation falls in four months from June to September, during which time flooding is a serious problem. Again there is regional variability. The northern regions often experience drought while the southern regions are prone to flooding.

2. Water Shortage
   - Despite having surface water resource of 2724 billion m^3, and underground water resource of 869.7 billion m^3 in 2002, per capita water resources in China are actually quite low due to the massive population. China's water resources rank 6^{th} in the world, while per capita water resources are only ¼ of the world average at 2220 m^3 per person.
   - Most areas of China are experiencing water shortages. More than 400 cities out of 668 cities in the country suffered from water shortage; and 110 of these cities faced a comparatively severe situation.
   - Rivers: Many rivers are being over-exploited. The internationally accepted warning level for utilization of river water is 30-40%. The utilization rate of water resources is at 60% for the Huaihe River, 65% for the Liaohe River, 62% for the Yellow River and as high as 90% for the Haihe River. For several years in a row, the Yellow River has failed to reach the sea.
   - Lakes: During past 50 years, the excessive reclaiming of land from lakes decreased the shortage capacity in some areas. Hubei was once known as "a province of more than a thousand lakes." It had 1066 lakes in the late 1950s, but now it has just 182.
   - Groundwater: Groundwater usage in China is poorly controlled and over extraction is becoming a serious problem causing land subsidence and falling groundwater levels. Beneath the North China Plain, water tables are falling by three to ten feet per year. This is shrinking the Chinese

grain harvest, which has fallen in four of the past five years. In that period, the harvest dropped by 66million tons.

3. Pollution
   - Pollution has further decreased available water resources.
   - Water bodies in 90% of China's cities are contaminated and over the past decade, some 70% of rivers and lakes across the country have been polluted.
   - Domestic Sources: Sewage reticulation systems are not keeping up with treatment capacity, resulting in underutilized wastewater treatment capacity. Current municipal wastewater treatment capacity will have to be nearly quadrupled over the next 20 years just to maintain current levels of service.
   - Industrial Sources: Industrial wastewater discharges from small manufacturing plants increased by nearly 250% from 1989 to 1995, but was followed by a reduction of about 50% from 1995 to 1998. This marked initial successes for a government-sponsored emergency shut-down program, but the long-term social impact has not yet been determined.
   - Agricultural Sources: The agricultural sector is largely responsible for nonpoint water pollution. Fertilizer runoff is the major cause of eutrophication in lakes, and today, one quarter of all lakes are affected by eutrophication.

Demand Side

Many of the issues concerning water supply can be traced to significant increases in demand and inefficient use.

1. Changes in Demand
   - Water consumption volume in China has risen dramatically. It increased from 100 billion m^3 in 1949 to 549.7 billion m^3. From 1949 to 1997, the acreage of irrigated land rose from 16 million hectares to 53 million hectares, and per-capita water consumption also leapt from less than 200 m^3 to 458 m^3.
   - Water consumption trends among different sectors have been changing over the past two decades and will continue to change. Agriculture will remain dominant, but its share of consumption will decrease while industrial and domestic usage will skyrocket. In 1949, agricultural water consumption accounted for 97.1% of the total water consumption. In 2000, the percentage dropped to 68.8%. Meanwhile, urban and industrial water consumption increased rapidly, from 2.9% to 31.2%. It is predicted that by 2050, the proportion of agricultural water consumption will dropped to 54% while the industrial and urban water consumption will increased to 46%.

- China's per capita water consumption remains low because of water scarcity. Supply capacity, growing at 7% annually, simply cannot keep pace with growing demand, increasing by 10% every year.

2. Inefficient Use
    - The water utilization rate is very low in China (about 40% overall) requiring much higher levels of water to be extracted from the natural water system.
    - China consumed an average of 465 cubic meters of water for each 10,000 yuan (1,205 USD) of grow domestic product it achieved last year, about four times the world average level.
    - Domestic: The problem of water inefficient use and water leakage in the cities is very serious. Beijing, Tianjin, Dalian, Qingdao have a recycling rate of about 70%, close to the level reached in most developed countries. However, most cities only recycle about 30-50% of water resources. Leaky pipes account for a loss of 360,000 tons of water every year.
    - Agriculture: Traditional irrigation method and poor irrigation facilities lead to low water utilization. Only 40% of the water used in irrigating the farmland is actually absorbed.
    - Industry: China's industry consumes 90 billion m^3 of water annually, of which only 50% is recycled. By recycling another 15% of water in industrial use, 5.25 billion m^3 could be saved annually. To produce industrial products of the same value, China consumes 10 to 20 times the amount used by developed countries.

Issues in Governance

Chinese authorities openly recognize the water management and quality problems within their borders and since the 1990s have actively sought to curb these issues. The government has reorganized old and created new organizations and systems to improve overall coordination and has enjoyed many successes. Problems in establishing universal integrated river-basin management systems, pricing, and sanitation control are the result of unclear or competing jurisdictions, weak enforcement, poor coordination, and competition between ministries as well as provincial and central governments.

1. Government agencies and responsibilities
    - The government has made reforms in the organization and responsibilities of various water management bodies. However, some overlaps in jurisdiction and responsibilities as well as gaps between agencies remain.
    - Ministry of Water Resources (MWR): overall water resources planning and management, major hydro infrastructures, and large hydropower generation; direct management and supervision on state-designated rivers and lakes (3-Rivers, 3-Lakes)
    - Ministry of Construction: urban waste water treatment investment
    - State Environmental Protection Agency (SEPA): waste water legislation and discharge compliance monitoring

- State Council: special committee mandates major courses for national water policy action
- State Planning Commission: In charge of 5-Year National Planning process and overall budget
- Water Administration Department of provinces and autonomous regions: These planning and implementation bodies operate within their respected administrative boundaries. They execute provincial water management plans, collect water use fees and approve water withdrawal permits, manage construction projects, set water prices, etc. In some cases, the provincial or local government is responsible for funding water improvement projects. After the initial planning phase, little oversight is given by the central government.
- River Basin Management organizations: These bodies are established by the MWR and assigned to a particular river basin. They provide data and suggestions for integrated approaches, but had no real authority prior to 2002.

2. Decrees, Laws, and Regulations
   - In the late 1990's the central government's responsibilities transferred from project examination and approval to macro-policy guiding, planning, legislation, and sectoral management using an integrated approach (integration between agencies and issues – safe water use, flood control, food production, etc.). This reflected a general shift away from an engineering-based mentality, which focused a great deal on dam construction, hydropower, and river navigability.
   - There is no shortage of plans, guides, and studies formulated by the State Council, MWR, SEPA, and other central government bodies that outline national as well as river-basin-specific or lake-specific plans. The first laws concerning water were passed in 1981. Up to 1998 15 State Council regulations and 22 ministry regulations had been passed regarding water resources development, utilization and protection, flood control and drought fighting, water and soil conservation, etc. In 2002 the "Water Law" was significantly revised.
   - The National Tenth Five-Year Plan for Environmental Protection differs little from the previous plan. It continues concentration on the Three Rivers (Huai, Hai, and Liao), Three Lakes (Tai, Chao, and Dian), Two-Zones (acid rain and sulfur dioxide), One City (Beijing), and One Sea (Bo Sea); sets targets to reduce pollution, and proposes 1137 projects requiring 262 billion yuan.

3. Integrated River Basin Management (IRBM) Strategies:
   - State Council and ministries all support IBRM strategies, but effective methods for implementation remain the big question.
   - Laws and regulations are executed by the provincial governments, which means that one river basin could be managed by several provinces with no mechanism by which to coordinate efforts.

- Only about 50% of administrative areas above the county level have a water management administrative body.
- 2002 “Water Law”: Revised to facilitate better coordination
    - River basin management organizations were elevated to the level of water administrative departments, giving them substantially more power.
    - River basin plans will be developed in a unified manner and become the master plan. The regional plans or other water projects will be subordinated to these master plans.
    - Lakes and rivers that cross provinces, autonomous regions, or municipalities will be managed by the central government in conjunction with the river basin management organizations, water administrative departments and other relevant departments of the riparian authorities
    - Water permits and water resource fees will be managed by the water administrative department or the river basin management organizations.
    - Future challenges: further definition of functions; relations between river basin management and jurisdictional management; overall participation; and integration of natural resource management.

4. Water Pricing:
    - Water pricing is largely left up to the individual provincial governments, making significant rises in price difficult for financially strained provinces.
    - “Industry Policies for Water Sector,” issued in 1997, created a framework for a market-based water sector; a key component was the decentralization of water price decision-making.
    - Currently, charges are applied to the supply service and the scarcity/opportunity cost, but even these charges are not universal. In some areas, water is literally provided for free.
    - Relatively steep increases in current water charges may be necessary to have a real impact on overuse, inefficiency, and pollution problems.

5. Water Quality Monitoring and Water Quality Standards
    - Problem One: two national water quality monitoring systems (SEPA and MWR) that overlap and duplicate each other
        - 15 out of 37 surface water quality indicators are monitored by both
        - 17 out of 27 groundwater quality indicators are monitored by both
        - River flow (i.e. pollutant loads) is monitored by MWR, not SEPA
        - SEPA publishes water quality data for public use, MWR does not
        - Little coordination, cooperation, or sharing of data

- Problem Two: no recent review of quality standards for relevance in current economic and technical situation
    - Gap between ambient standards for the designated water uses and the actual standards that are likely to be achievable within any reasonable planning time-frame
    - May not take adequate account of recent developments in drinking water treatment technology

6. Conclusions
    - Continue integration of water management system by further defining and standardizing roles and responsibilities horizontally and vertically, i.e. central ministries, provincial administrative bodies, and river-basin management organizations.
    - Expand use of water-withdrawal permits and establish plan for water pricing.
    - Continue review of the water-related laws and regulations to improve and reinforce supervision mechanisms, law enforcement, pollution restrictions, and water economy.
    - Continue public participation mass media campaigns